

CLAIMS

1. An electric power steering for generating an assist steering torque from an electric motor in response to a steering torque applied to a steering wheel, and
5 then transmitting the assist steering torque to an output shaft of a steering equipment after a speed reduction using a worm gear system,

wherein the worm gear system causes a hourglass worm driven by the electric motor to mesh with a worm wheel
10 provided to the output shaft, and

at least one of bearings that bear rotatably the hourglass worm is composed of a tapered roller bearing, an angular contact bearing, or a magneto ball bearing, from which an outer ring can be separated.

15 2. An electric power steering for generating an assist steering torque from an electric motor in response to a steering torque applied to a steering wheel, and then transmitting the assist steering torque to an output shaft of a steering equipment after a speed reduction
20 using a worm gear system,

wherein the worm gear system causes a hourglass worm driven by the electric motor to mesh with a worm wheel provided to the output shaft,

a bearing holder is provided to at least one of
25 bearings that bear rotatably the hourglass worm, and is

put onto an outer ring of the bearing and has a taper surface on an outer peripheral surface, and

a taper hole with which the taper surface of the bearing holder is engaged is formed in a gear housing.

5 3. An electric power steering for generating an assist steering torque from an electric motor in response to a steering torque applied to a steering wheel, and then transmitting the assist steering torque to an output shaft of a steering equipment after a speed reduction
10 using a worm gear system,

wherein the worm gear system causes a hourglass worm driven by the electric motor to mesh with a worm wheel provided to the output shaft,

15 a bearing holder is provided to at least one of bearings that bear rotatably the hourglass worm, and is fitted into an inner ring of the bearing and has a taper surface on an inner peripheral surface, and

20 a taper surface that is engaged with the taper surface of the bearing holder is formed on a shaft end portion of the hourglass worm.

4. An electric power steering for generating an assist steering torque from an electric motor in response to a steering torque applied to a steering wheel, and then transmitting the assist steering torque to an output shaft of a steering equipment after a speed reduction

using a worm gear system,

wherein the worm gear system causes a hourglass worm driven by the electric motor to mesh with a worm wheel provided to the output shaft,

5 an inner peripheral surface of an inner ring of at least one of bearings that bear rotatably the hourglass worm is formed as a taper surface, and

a taper surface that is engaged with the taper surface of the inner ring is formed on the hourglass worm.

10 5. An electric power steering for generating an assist steering torque from an electric motor in response to a steering torque applied to a steering wheel, and then transmitting the assist steering torque to an output shaft of a steering equipment after a speed reduction
15 using a worm gear system,

wherein the worm gear system causes a hourglass worm driven by the electric motor to mesh with a worm wheel provided to the output shaft, and

20 at least one of bearings that bear rotatably the worm wheel is a tapered roller bearing, an angular contact bearing, or a magneto ball bearing, from which an outer ring can be separated.

6. An electric power steering for generating an assist steering torque from an electric motor in response
25 to a steering torque applied to a steering wheel, and

then transmitting the assist steering torque to an output shaft of a steering equipment after a speed reduction using a worm gear system,

wherein the worm gear system causes a hourglass worm
5 driven by the electric motor to mesh with a worm wheel provided to the output shaft,

a bearing holder is provided to at least one of bearings that bear rotatably the worm wheel, and is put onto an outer ring and has a taper surface on an outer
10 peripheral surface and

a taper hole with which the taper surface of the bearing holder is engaged is formed in a gear housing.

7. An electric power steering for generating an assist steering torque from an electric motor in response
15 to a steering torque applied to a steering wheel, and then transmitting the assist steering torque to an output shaft of a steering equipment after a speed reduction using a worm gear system,

wherein the worm gear system causes a hourglass worm
20 driven by the electric motor to mesh with a worm wheel provided to the output shaft, and

at least one of bearings that bear rotatably the hourglass worm is provided such that a position can be changed with respect to a gear housing in a
25 center-to-center direction.

8. An electric power steering for generating an assist steering torque from an electric motor in response to a steering torque applied to a steering wheel, and then transmitting the assist steering torque to an output
5 shaft of a steering equipment after a speed reduction using a worm gear system,

wherein the worm gear system causes a worm driven by the electric motor to mesh with a worm wheel provided to the output shaft, and

10 a tooth profile of the worm wheel and a tooth profile of the worm are shaped into a special tooth profile in which a first line of contact and a second line of contact, which intersect with a sliding direction of the worm and intersect with each other, and a tooth surface of an
15 intermediate gear is formed as a conical surface.

9. An electric power steering according to claim 8, wherein at least a dedendum shape of the worm is formed as a hourglass shape.

10. An electric power steering according to claim
20 8 or 9, wherein a consistency of a grease is set to 385 or less.

11. An electric power steering according to claim 10, wherein a width of the worm wheel is formed wider than a minimum dedendum circle diameter of the hourglass
25 worm.

12. An electric power steering according to claim
10 or 11, wherein a clearance on both end sides is set
larger than a clearance in a center portion of the worm
wheel in a tooth trace direction.

5 13. An electric power steering according to any one
of claims 10 to 12, wherein the electric motor is a
brushless motor.

14. An electric power steering for generating an
assist steering torque from an electric motor in response
10 to a steering torque applied to a steering wheel, and
then transmitting the assist steering torque to an output
shaft of a steering equipment after a speed reduction
using a worm gear system,

wherein the worm gear system causes a hourglass worm
15 driven by the electric motor to mesh with a worm wheel
provided to the output shaft.

15. An electric power steering according to claim
14, wherein a backlash on both end portions of the
hourglass worm is set larger than a backlash in an
20 engagement center portion of the hourglass worm.

16. An electric power steering according to claim
14 or 15, wherein a number of working teeth between the
hourglass worm and the worm wheel is increased in response
to a transmission torque.

25 17. An electric power steering according to claim

16, wherein at least one of working teeth of the hourglass worm and the worm wheel can be deformed elastically.

18. An electric power steering according to claim 17, wherein at least tooth portion of the worm wheel is
5 formed of resin material.

19. An electric power steering according to claim 18, wherein a number of threads of the hourglass worm is set to 2 threads or more.

20. An electric power steering according to claim
10 14, wherein a tooth thickness adjusting process of reducing each tooth thickness is applied to the hourglass worm.

21. An electric power steering according to claim
20, wherein the tooth thickness adjusting process of the
15 tooth thickness adjusting process shapes a tooth profile such that a tooth thickness is thinned toward both end portions from a center portion of the worm in an axial direction.

22. An electric power steering according to claim
20 20 or 21, wherein the tooth thickness adjusting process of the tooth thickness adjusting process shapes the tooth profile such that the process is not applied to a predetermined interval of the center portion of the worm in the axial direction and the process is applied to
25 remaining intervals either to reduce the tooth thickness

toward both end portions or to form a constant tooth thickness that is thinner than the tooth thickness in an interval in which the process is not applied.